



Palo Verde Nuclear  
Generating Station

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192-01079-WEI/AKK/RAS  
December 15, 2000

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Mail Station P1-37  
Washington, DC 20555-0001

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Unit 2  
Docket No. STN 50-529  
License No. NPF-51  
Licensee Event Report 2000-007-00**

Attached please find Licensee Event Report (LER) 50-529/2000-007-00, prepared and submitted pursuant to 10CFR50.73. This LER reports an automatic reactor trip which occurred on November 18, 2000. The corrective actions described in this LER are not necessary to maintain compliance with regulations and this letter makes no commitments to the NRC.

In accordance with 10CFR50.73(d), a copy of this LER is being forwarded to the Regional Administrator, NRC Region IV and the resident inspector. If you have questions regarding this submittal, please contact Daniel G. Marks, Section Leader, Regulatory Affairs, at (623) 393-6492.

Sincerely,

WEI/AKK/RAS

Attachment

cc: E. W. Merschoff (all with attachment)  
J. H. Moorman  
J. N. Donohew  
INPO Records Center

**LICENSEE EVENT REPORT (LER)**(See reverse for required number of  
digits/characters for each block)

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)

**Palo Verde Nuclear Generating Station Unit 2**

DOCKET NUMBER (2)

**05000529**

PAGE (3)

**1 OF 7**

TITLE (4)

**Reactor Trip Due To Licensed Operator Cognitive Error**

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
11	18	2000	2000	- 007	- 00	12	15	2000	N/A	
OPERATING MODE (9) 1			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
			20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)				
POWER LEVEL (10) 45			20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)				
			20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71				
			20.2203(a)(2)(ii)	20.2203(a)(4)	X 50.73(a)(2)(iv)	OTHER				
			20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A				
			20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)					

**LICENSEE CONTACT FOR THIS LER (12)**

NAME

**Daniel G. Marks, Section Leader, Regulatory Affairs**

TELEPHONE NUMBER (Include Area Code)

**623-393-6492****COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)**

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	TL	EXC	G084	Y					

**SUPPLEMENTAL REPORT EXPECTED (14)**

YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO
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**EXPECTED SUBMISSION DATE (15)**

MONTH	DAY	YEAR

**ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)**

On November 18, 2000 at 1147 Mountain Standard Time (MST), Unit 2 was in MODE 1 (Power Operation), at approximately 45 percent rated thermal power when a reactor protection system actuation tripped the plant. Prior to the reactor trip, at approximately 1058 MST, Unit 2 had experienced a generator/turbine trip followed by a reactor power cutback.

The turbine trip was the result of failed on-line maximum excitation limit and field current regulator circuit boards. The cause of the reactor trip was licensed operator cognitive error.

There have been no previous similar events reported in the last three years.

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

### 1. REPORTING REQUIREMENT(S):

APS is reporting this condition pursuant to 10CFR50.73(a)(2)(iv) as an event or condition that resulted in a manual or automatic actuation of any engineered safety feature (ESF), including the reactor protection system.

### 2. DESCRIPTION OF STRUCTURES, SYSTEMS, COMPONENTS AND TERMS:

#### Reactor Protection System (RPS)(EIS:JC)

The RPS provides a rapid and reliable shutdown of the reactor to protect the core and the reactor coolant system pressure boundary from potentially hazardous operating conditions. Shutdown is accomplished by the generation of reactor trip signals. The trip signals open the reactor trip switchgear breakers (EIS: AA, BRK), de-energizing the control element drive mechanism coils (EIS: AA), allowing all control element assemblies (CEAs)(EIS: AA) to drop into the core by the force of gravity.

#### Western Systems Coordinating Council (WSCC)

The WSCC coordinates the electric power system for the western part of the continental United States, Canada, and Mexico.

#### Main Generator Excitation and Regulation System (MB)(EIS: TL)

The main generator excitation and voltage regulation system (GENERREX excitation system) is a static excitation and control system. The major components of this system include: the excitation power source, the exciter cubicle containing power rectifiers and related control equipment, the regulator cubicle, the generator brush-holder rigging and slip rings, and the control station with mimic bus.

### 3. INITIAL PLANT CONDITIONS:

On November 18, 2000 at 1147 Mountain Standard Time (MST), Unit 2 was in MODE 1 (Power Operation), at approximately 45 percent rated thermal power when a RPS actuation

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tripped the plant. Prior to the reactor trip, at approximately 1058 MST, Unit 2 had experienced a generator/turbine trip followed by a reactor power cutback.

#### 4. EVENT DESCRIPTION:

Prior to the reactor trip, on November 17, 2000, operations, reactor engineering, system engineering and scheduling personnel attended a briefing on the upcoming WSCC static volt-ampere reactive (VAR) testing that was scheduled for November 18, 2000. The briefing included a discussion of the Static VAR test, expectations, and reactor power cutback contingencies.

On November 18, 2000 at approximately 1008 MST, Unit 2 was operating at approximately 100 percent power when WSCC recommended static VAR testing was commenced to validate model parameters of the electrical generator and exciter. The testing was being conducted in accordance with an approved plant procedure and the data gathered from the testing would be used to determine design characteristics unique to PVNGS, to model the plant response to transients and in grid stability studies. To facilitate the testing, Unit 2 was placed in a condition that allowed maximum VAR output.

Operations personnel were maintaining a VAR loading of 633 mega-VARs for approximately seven minutes when at 1058 MST, a generator/turbine trip occurred. The steam bypass control system (SBCS)(EIS: JI) responded and a reactor power cutback initiated with control systems responding appropriately. Operations personnel entered the applicable procedure for a load rejection and verified that CEA groups 4 and 5 had fully inserted into the reactor core, group 3 CEAs were positioning, generator output breakers had opened and the SBCS was operating correctly. Reactor power stabilized at approximately 45 percent power.

Operations personnel also noted that CEA groups 4 and 5 were exceeding their power dependent insertion limits (PDILs) and that no action was required as the LCO for regulating CEA insertion limits is not applicable for up to 2 hours following a reactor power cutback. Technical Specification (TS) Limiting Condition for Operation (LCO) 3.2.5, condition A was entered as the core average axial shape index (ASI) exceeded the COLR limit of  $\leq 0.16$ . Operations personnel reviewed the PVNGS Emergency Plan (E-Plan) and



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determined no event declarations were required and made notifications in accordance with PVNGS event reporting guidance.

Operations personnel monitored pressurizer pressure and steam generator levels and noted they were recovering as expected. Based on the possibility the turbine could be recovered, the control room supervisor (CRS) followed the applicable steps of the load rejection procedure to stabilize power. Operations personnel conducted a post power cutback tailboard meeting upon verification of the cutback, but a target (desired) power level was not established.

At approximately 1116 MST, departure from nucleate boiling ratio (DNBR) exceeded core operating limits supervisory system (COLSS) limits and operations personnel entered LCO 3.2.4, condition A.

At 1118 MST, with reactor power at approximately 45 percent, reactor engineering recommended a boration of the reactor coolant system (RCS)(EIS: AB) to allow withdrawal of the group 3 CEAs while maintaining cold leg temperature between 560 and 562 degrees. At this time, a 20 gallon per minute (gpm) boration rate was recommended, but a 10 gallon per minute (gpm) rate was implemented due to a chemical and volume control system (CVCS)(EIS: CA) line-up.

By 1129 MST, DNBR no longer exceeded COLSS limits and the ASI had returned to a value of < 0.16. Operations personnel exited LCO 3.2.4, condition A.

At 1138 MST, the CVCS line-up was secured and the RCS boration rate was increased to 20 gpm. Simultaneously, an azimuthal tilt alarm was received and reactor engineering recommended to the CRS that the azimuthal tilt constants be changed in the core protection calculator (CPC)(EIS: JC).

At 1143 MST, the CRS (utility-licensed operator), acting on a recommendation from reactor engineering (other utility personnel), directed operations personnel to withdraw CEAs in order to raise RCS cold leg temperature to 565 degrees to counteract azimuthal tilt. Withdraw of CEAs commenced in accordance with ASI and Azimuthal Tilt Control guidelines.

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A crew briefing was not conducted prior to CEA withdraw and operations personnel were performing a number of required activities (e.g., turbine fault diagnosis, changing azimuthal tilt constants in the CPCs, maintenance of boration flow, etc.). At this time, not all of the operating crew were aware that the boron addition and the xenon build-in following the load rejection had reduced reactor power from 45 to 33 percent, or that CEA withdrawal was underway.

At 1147 MST, the reactor tripped upon reaching the CPC auxiliary variable over power trip (VOPT) setpoint. Reactor power at the time of the trip was approximately 45 percent.

Operations personnel implemented the applicable reactor trip emergency operation procedure. All CEAs inserted as required and the trip was classified as uncomplicated with respect to the emergency plan. No safety functions were jeopardized. The primary plant was stabilized in Mode 3 in forced circulation with both steam generators being used for heat removal.

At 1210 MST, operations personnel exited the reactor trip emergency operating procedure and entered the Mode 3 to Mode 5 Operations procedure.

At 1536 MST, APS reported the reactor trip to the NRC via the emergency notification system (reference ENS 37533).

#### 5. ASSESSMENT OF SAFETY CONSEQUENCES:

Plant performance during the reactor power cutback was as expected given a generator trip from 100 percent power, with no challenges to any safety function. Analysis of the available data indicates that the RPS responded as required to this event. A reactor trip was generated by the CPCs due to an auxiliary variable overpower trip. The trip occurred at the proper setpoint and was received within the required time frame.

Subsequent to the reactor trip, the plant responded as required, the reactor trip was uncomplicated, no safety limits were exceeded, and the event was bounded by current safety analyses. Primary and secondary pressure boundary limits were not exceeded as a result of the reactor trip. The transient did not cause any violation of the safety limits (i.e.,

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departure from nucleate boiling ratio, linear heat rate, pressurizer pressure). Therefore, there were no adverse safety consequences or implications as a result of this event. This event did not adversely affect the safe operation of the plant or health and safety of the public and there were no conditions during this event where the fulfillment of the safety function would not have been met.

#### 6. CAUSE OF THE EVENT:

##### Equipment

The turbine trip was the result of a main generator trip, via the 186G-9 lockout relay (EILS: RLY). Troubleshooting revealed the on-line maximum excitation limit circuit board and the field current regulator circuit board failed.

##### Personnel

An investigation of this event is in progress in accordance with the APS corrective action program. APS' preliminary determination is that the reactor trip was due to cognitive error by a licensed operator performing CEA manipulations. This cognitive error was due to ineffective command and control, incorrect operator mindset (i.e., withdrawal of CEAs would raise RCS cold leg average temperature) and the lack of appropriate staff briefings.

#### 7. CORRECTIVE ACTIONS:

##### Equipment

The on-line maximum excitation limit circuit board and the field current regulator circuit boards were replaced and calibrated on November 19, 2000.

##### Personnel

The responsible operations personnel were coached on the effective use of tailboard briefings, and command and control.

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PVNGS operations personnel were briefed on the Unit 2 reactor trip and on the CPC auxiliary VOPT setpoints.

Additional corrective actions are currently under review and will be implemented upon completion of APS' investigation of this event. These actions will include training enhancements to strengthen command and control and reduce the possibility of a mindset on the part of a single operator from causing a plant event.

8. PREVIOUS SIMILAR EVENTS:

There have been no previous similar event was reported in the last three years.